

Ozone, the main ingredient of smog, presents a serious air quality problem in many parts of the United States. Even at low levels, ozone can cause health effects. You can take simple steps, described in this pamphlet, to protect your health from ozone.

What is ozone?

Ozone is a colorless gas found in the air we breathe. Ozone is good or bad, depending where it occurs.

Good ozone is present naturally in the Earth’s upper atmosphere—10 to 30 miles above the Earth’s surface. This natural ozone shields us from the sun’s harmful ultraviolet rays.

Bad ozone forms near ground level when air pollutants (emitted by sources such as cars, power plants, and chemical plants) react chemically in the presence of sunlight. Ozone pollution is more likely to form during warmer months. This is when the weather conditions normally needed to form ground-level ozone—lots of sun—occur.

Are you at risk from ground-level ozone?

Several groups of people are particularly sensitive to ozone, especially when they are active outdoors. This is because ozone levels are higher outdoors, and physical activity causes faster and deeper breathing, drawing more ozone into the body.

In general, as concentrations of ground-level ozone increase, both the number of people affected and the seriousness of the health effects increase. Also, more people with lung disease visit doctors or emergency rooms and are admitted to the hospital. When ozone levels are very high, everyone should be concerned about ozone exposure.

People who may be particularly sensitive to ozone include:

People with lung diseases, such as asthma, chronic bronchitis, and emphysema will generally experience more serious health effects at lower ozone levels.

Children are at higher risk from ozone exposure because:

- They often play outdoors in summer when ozone levels are higher.
- They are more likely to have asthma, which may be aggravated by ozone exposure.
- Their lungs are still developing.

Older adults may be more affected by ozone exposure, possibly because they are more likely to have pre-existing lung disease.

Active people of all ages who exercise or work vigorously outdoors have higher exposure to ozone than people who are less active.

Some healthy people are more sensitive to ozone. They may experience health effects at lower ozone levels than the average person even though they have none of the risk factors listed above. There may be a genetic basis for this increased sensitivity.



People of all ages who are active outdoors are at risk from ozone exposure.

How can ground-level ozone affect your health?

Ozone can:

- **Irritate your respiratory system.** When this happens, you may cough, feel irritation or soreness in your throat, or

experience chest tightness or pain when taking a deep breath.

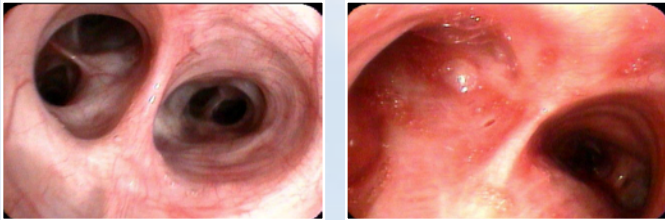
- **Reduce lung function.** This can make it more difficult for you to breathe as deeply and vigorously as you normally would, especially when exercising. You may notice that breathing starts to feel uncomfortable and that you are taking more rapid and shallow breaths than normal.
- **Inflate and damage cells that line your lungs.** Within a few days, the damaged cells are replaced and the old cells are shed—much like the way your skin peels after a sunburn.
- **Make your lungs more susceptible to infection.**
- **Aggravate asthma.** When ozone levels are unhealthy, more people with asthma have symptoms that require a doctor’s attention or the use of medication. Ozone makes people more sensitive to allergens—the most common triggers for asthma attacks. Also, asthmatics may be more severely affected by reduced lung function and airway inflammation. People with asthma should have an asthma action plan and follow it carefully when ozone levels are unhealthy.
- **Aggravate other chronic lung diseases such as emphysema and chronic bronchitis.**
- **Cause permanent lung damage.** Repeated short-term ozone damage to children’s developing lungs may lead to reduced lung function in adulthood. In adults, ozone exposure may accelerate the natural decline in lung function that occurs with age.

Many of these effects can lead to increased school or work absences, visits to doctors and emergency rooms, and hospital admissions. Research also indicates that ozone exposure can increase the risk of premature death from heart or lung disease, although more research is needed to understand how ozone may affect the heart and cardiovascular system.

When ozone levels may be unhealthy—for example on hot sunny days—notice whether you have any respiratory symptoms. If you do, take steps to protect your health, as described below.

Are there always symptoms?

People living in areas where ozone levels are frequently unhealthy may find that their initial symptoms go away over time—particularly when exposure to unhealthy ozone levels continues for several days. However, ozone can continue to



Ozone can inflame the lung’s lining. These photos show a healthy lung airway (left) and an inflamed lung airway (right). Photos courtesy of PENTAX Medical Company.

damage the lungs even when the symptoms are no longer noticeable. The best way to protect your health is to find out when ozone levels are elevated in your area and take simple steps to minimize your exposure—even when you don’t feel obvious symptoms.

How can you avoid unhealthy exposure to ozone?

When ground-level ozone is at unhealthy levels, your chances of being affected increase the longer you are active outdoors and the more strenuous your activity. Since exercise is good for health, it’s important to stay active and know when to make changes. When ozone levels are unhealthy, protect your health by:

- Reducing the time you are active outdoors.
- Scheduling the activity for the morning or evening when ozone levels are usually lower.
- Substituting a less intense activity. For example, go for a walk instead of a jog. For each person, intensity depends on physical fitness, but typically:
 - » Less intense activities include things like climbing stairs, playing tennis or baseball, simple garden or construction work, and light jogging, cycling, or hiking.
 - » More intense activities include playing basketball or soccer, chopping wood, heavy manual labor, and vigorous running, cycling, or hiking.

No matter how fit you are, cutting back on the level or duration of outdoor activity when ozone levels are unhealthy will help protect you from ozone’s harmful effects.